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THE PRESERVATIVE TREATMENT OF FARM TIMBERS.

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THE PRESERVATIVE TREATMENT OF FARM TIMBERS.

INTRODUCTION.

The amount of wood used on the farms of the country and exposed to rapid decay is enormous. It is estimated that 1 billion fence posts and rails, the equivalent of 6 billion board feet, are required each year. For this class of material durability is the first requisite. The naturally durable woods were formerly plentiful over large areas, but in many sections they have now become too scarce and dear to use. There remains, however, an abundance of inferior woods which, when preserved from decay, are entirely satisfactory substitutes.

Many different preservatives have been widely used for ties, poles, and piling. The scarcity of durable fence posts is, however, comparatively recent, and definite information regarding the preservative treatment of fence posts has naturally been lacking. A series of experiments to determine the best manner of creosoting posts of various inferior woods was, therefore, undertaken by the Forest Service in cooperation with the following States and agricultural institutions: The Commissioner of Agriculture and Industries of the State of Alabama, Montgomery, Ala.; the Alabama Polytechnic Institute, Auburn, Ala.; the North Louisiana Agricultural Experiment Station, Calhoun, La.; the Maryland Agricultural Experiment Station, College Park, Md.; the South Carolina Agricultural Experiment Station, Clemson College, S. C.; the Ames Experiment Station, Ames, Iowa; and the University of Minnesota Experiment Station, St. Paul, Minn. These organizations heartily supported this work, and to their cordial cooperation is due much of the information that has been acquired.

DECAY AND METHODS OF PRESERVATION.

Decay consists in the destruction of the wood tissues by low forms of plant life. These organisms we term fungi. It is possible that bacteria may be associated in some cases, but as yet we have no positive proof of it. It follows that the object of all preservative treatment is to prevent the development of these organisms, and that the most effective treatment is the one that accomplishes this for the longest period.

Fungi require for their best development a certain balance between the air and the moisture content of the wood, and a favorable temperature. Thorough seasoning, on the one hand, or thorough saturation with moitsure on the other, alters this balance to such an extent that the growth of the organism is either retarded or prohibited. Air seasoning only retards the growth.

There are several methods by which timbers may be given more thorough preservative treatment. The surface of the wood may be soaked with paint or some similar substance. Such a coating keeps the wood dry, and more or less effectually excludes the entrance of the decay-producing organisms. Such coatings, however, should be applied only to well-seasoned material, since they will also tend to retard the escape of such moisture as may be already within the timber. Better preservatives are the products of the distillation of coal tar and petroleum tar, which, in addition to possessing the advantages of paint, are antiseptics and poisonous to fungi. The deeper such antiseptics penetrate the wood the more lasting is their effect.[a]

It is well known that wood decays most rapidly when placed in contact with the surface of the ground, because the wood-destroying organisms find there more uniform conditions of heat and moisture to encourage their development. For this reason the ground line of a post must be thoroughly treated, whereas portions of the post above and below this point require less treatment. The climate of the locality should also be considered. In the warm Gulf States or in a moisture-laden atmosphere posts require more thorough treatment than in a cooler northern climate or on the arid plains.

PROLONGING THE LIFE OF POSTS.

The usual methods of prolonging the life of fence posts are here considered in the order of their efficiency, beginning with the cheapest and least effective. One point deserves special emphasis, namely, that in spite of the high first cost, the best treatment is the most economical in the long run. The study upon which this publication is based indicates that impregnation with creosote is decidedly the best preservative method.

SIMPLE METHODS.

Peeling and seasoning.—The value of seasoning has already been explained. It is likewise important to remove the bark, so that the outer layers of the wood may dry more thoroughly.

[a] See Forest Service Bulletin 78, "Wood Preservation in the United States," by W. F. Sherfesee.

A preservative method, akin to seasoning, consists in piling stones or similar material around the base of the post. This checks the growth of weeds and permits the air to circulate more freely around the post. It is doubtful, however, whether the saving justifies the cost.

Charring.—Good results have been obtained by charring the post over an open fire. The wood must first be thoroughly seasoned, and care must be taken not to let the wood "check" or split from the heat. Too deep charring, which will weaken the post, must obviously be avoided. In some cases it is unnecessary to char the entire post, but the burning should always extend 1 foot above and 1 foot below the ground line. It is often a good plan to char the very top of the post.

Painting.—Treatment with the brush should be resorted to only when more efficacious methods are impracticable. If brush treatments are to be effective, the posts must have been thoroughly seasoned, or the surface coating will afterwards be broken by the opening of seasoning checks through which moisture will enter the wood. At best surface coatings are not very durable. Some of the substances which may be applied with a brush are whitewash, petroleum-tar creosote,[a] coal-tar creosote,[b] and various patented products of coal tar and petroleum tar. Paint and whitewash are inferior to antiseptic preservatives; products of coal tar (creosote, etc.) are the best. These are best applied hot, in two or more coats. A barrel (50 gallons) of creosote should be sufficient to paint at least 300 posts with three coats for the butts and two for the tops.

Dipping.—One defect of brush treatment is that the preservative does not enter readily the cracks and checks. This defect may be overcome by dipping the posts in the preservative. Another advantage of dipping, as compared with painting, is a saving in labor. On the other hand, dipping requires a larger quantity of preservative, and, in addition to the amount consumed, there must be enough surplus to keep the barrel or tank filled to the proper depth. This usually forbids the use of any expensive preservative for dipping. Petroleum tar, coal tar, and the creosotes, however, may often be advantageously employed.

Posts have been treated by dipping the butt in cement. This is hardly satisfactory, owing to the ease with which the protective covering may be broken; moisture is absorbed after treatment and causes the wood to expand and crack the cement.

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[a] Petroleum-tar creosote is derived from petroleum tar, which is a by-product of the manufacture of water gas. It is possibly not so efficient a preservative as coal-tar creosote, but it may be used with good results and is often cheaper.

[b] Coal-tar creosote is a derivative of coal tar, which is a by-product in the manufacture of coal gas and of coke. Its price is comparatively low.

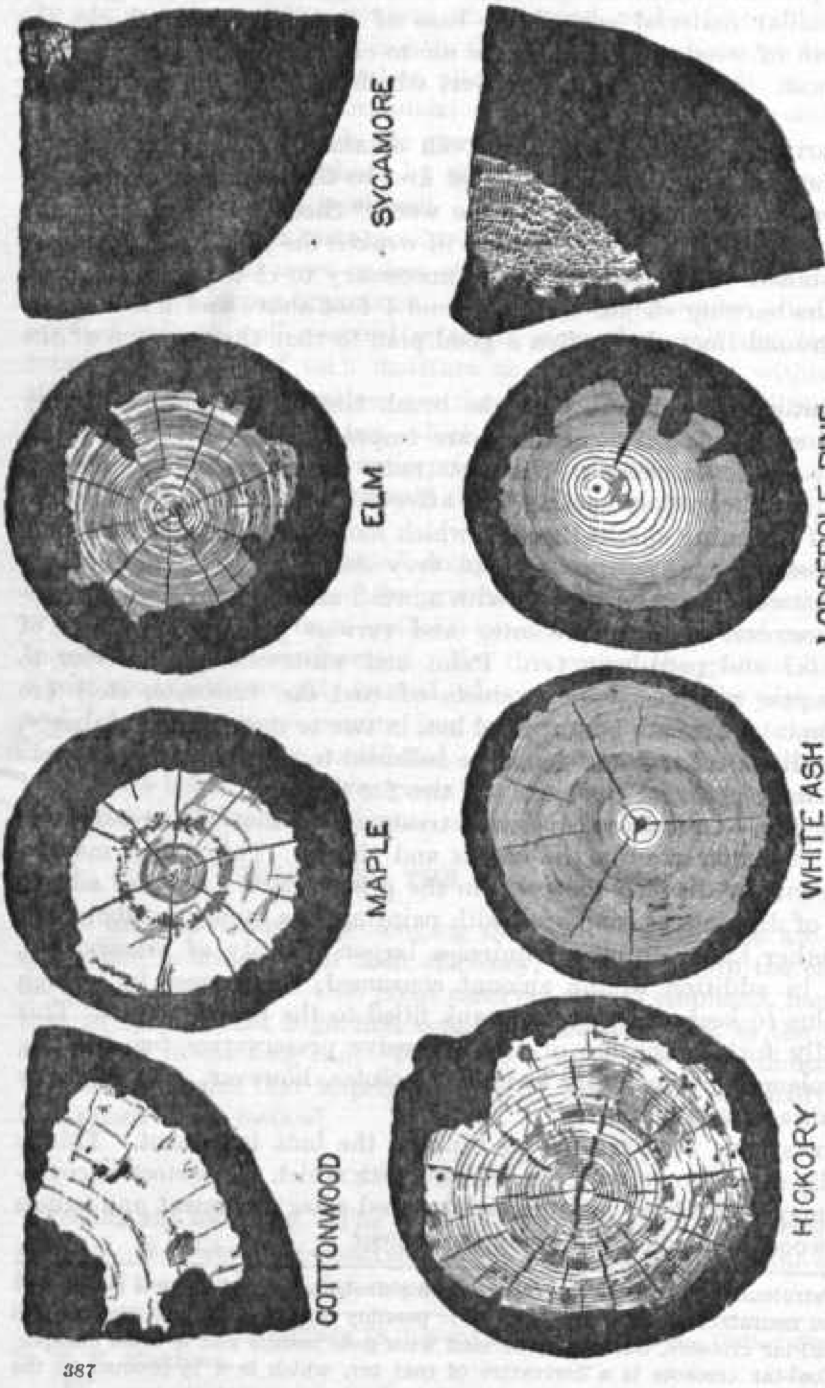

FIG. 1.—Sections of posts of various woods treated with creosote by the open-tank process. All the posts are drawn to the same scale, and are approximately 5 inches across. The black areas show the creosote penetration, which corresponds generally to the sapwood.

Cold-bath treatment.—The treatments thus far considered merely coat the surface with a preservative. Penetration or "impregnation" of some woods is secured by prolonged soaking (a ten-hour bath) in the preservative at ordinary air temperature. This method of treatment is attractive in many cases, because it is so simple. Nevertheless, far better results are obtained in all cases by the use of a hot bath as well as a cold bath. As a rule only the cheaper preservatives can profitably be used in the cold-bath treatment, for the same reason as in dipping. Coal tar is so ropy and sticky that it will scarcely penetrate even the most easily treated woods. Crude petroleum enters the wood rather readily but lacks strong antiseptic qualities. A long bath in crude petroleum may, however, prove a feasible method of treatment where petroleum is very cheap and the woods used are readily impregnated. Creosote is usually the best preservative to employ. Coal-tar creosote requires a slight heating to liquefy it.

Water in the wood cells resists the penetration of the oil. Thorough seasoning before treatment is, therefore, necessary to allow the oil to penetrate readily and to prevent checking after treatment.

The cold-bath method of treatment has not yet been thoroughly investigated. It is probable, however, that it will impregnate but few woods. The woods which are likely to prove most suitable are beech, cottonwood, the gums, pin and red oaks, the pines, sycamore, and tulip tree.

IMPREGNATION WITH CREOSOTE.

Method of treatment.—The impregnation of fence posts with creosote is best accomplished by the so-called "open-tank" process.[a] This consists of heating the wood for a certain period and then cooling it in the preservative. The principle is simple: During the heating the high temperature causes the air and water contained in the wood cells to expand, so that a portion of this air and water is forced out. The rest contracts as the subsequent cooling progresses, and a partial vacuum is formed, into which atmospheric pressure forces the cool preservative. Figure 1 shows sections of posts treated in this manner.

The open-tank principle may be variously applied in the treatment of posts. The best way to heat the posts is to immerse their butts in creosote maintained at a temperature of 220° F. If a single tank is used the cooling bath may be given by permitting the temperature to fall, and in this case the preservative must, of course, be used for the hot bath. It is better, however, to employ an additional tank containing the cold preservative. If two tanks are used and a

[a] So designated to distinguish it from the "closed" or "pressure" cylinder process which is often employed in creosoting ties and piling.

thorough impregnation of the top of the post is desired, the cold-bath tank should be large enough to permit the soaking of the entire post. The top of the post will not be too heavily impregnated, because it has not been immersed in the hot oil. Creosote is usually the most satisfactory preservative. With two tanks crude petroleum or any heavy (high-boiling) oil may be used in the hot-bath tank.

Forms of treating tanks.—The simplest form of treating plant is shown in figure 2. It consists of two creosote barrels, placed about 7 feet apart and connected by a 3 or 4 inch pipe. The heating is accomplished by building a fire under the pipe. This outfit is, in some particulars, unsatisfactory. It is certain to leak after a few days, and, in addition, the shallowness of the barrels is a serious disadvantage.

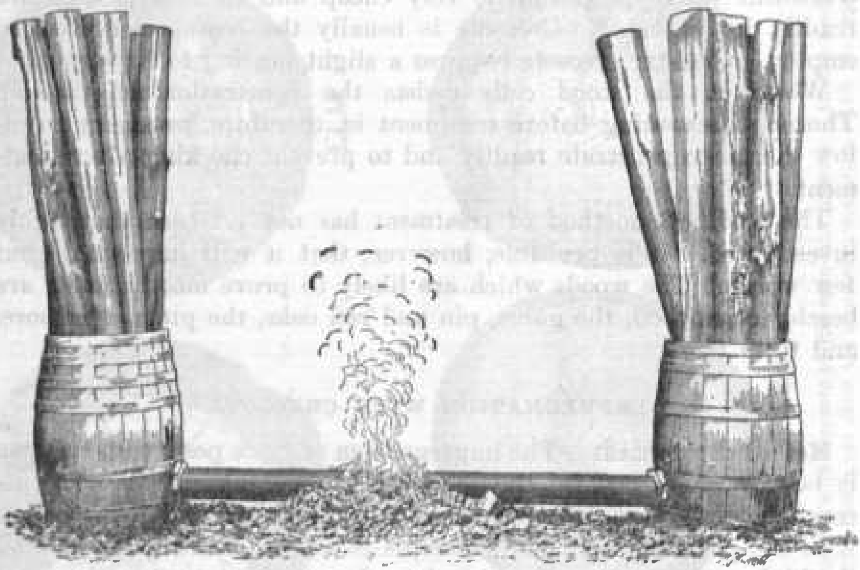

FIG. 2.—Barrel outfit.

Nevertheless, the barrel outfit may suffice when only a few posts of readily impregnated wood are to be treated and when, in consequence, the treatments are few and short. To lessen the danger of leakage the pipe should be fitted with lock (jam) nuts. Further, the barrels should be shielded from the direct heat of the fire. Each barrel should be set in a shallow box or provided with some gutter arrangement to catch the oil in case of an unexpected leak. A **U** of 1½-inch pipe, as shown in figure 3, may be used in heating a single barrel.

The apparatus shown in figure 3 will probably be of most general value. The method of heating used for the barrel outfit is here applied to a light (14 gauge) galvanized-iron tank. A cylindrical tank, 3 feet in diameter and 4 feet high, fitted with a **U** of 3-inch

pipe, can be purchased for $12 to $15. This cost is very reasonable when the permanency of the outfit is considered.

In the method of heating illustrated in figure 4 a black iron tank is used, and the fire is built under it. A fire box and a hot-air chamber are constructed with brick, and a sheet-iron collar caps the masonry. The tank is supported by a strong foundation. Such an outfit, with a tank 3 feet in diameter and 4 feet high, made of $\frac{3}{16}$-inch black iron, would probably cost from $25 to $30. The tanks used by the Forest Service are shown in figure 5. These are heated by steam and prove satisfactory. The two tanks and the necessary piping cost $50.

The use of a cold-bath tank is advisable whenever a large quantity of material is to be creosoted. If only butt impregnation is desired a cylindrical, galvanized-iron tank 3 feet in diameter and 4 feet high, costing $10 or $12, may be employed. If the tops are also to be impregnated the tank should be rectangular, 8 feet long, 3 feet wide, and 3 feet deep. Such a tank would cost approximately $20. Provision must be made for slightly heating the cold-bath tank, since creosote is often solid at atmospheric temperature. Best results are obtained at a temperature of 100° to 120° F. A thermometer reading to 250° F. is a necessary part of every equipment.

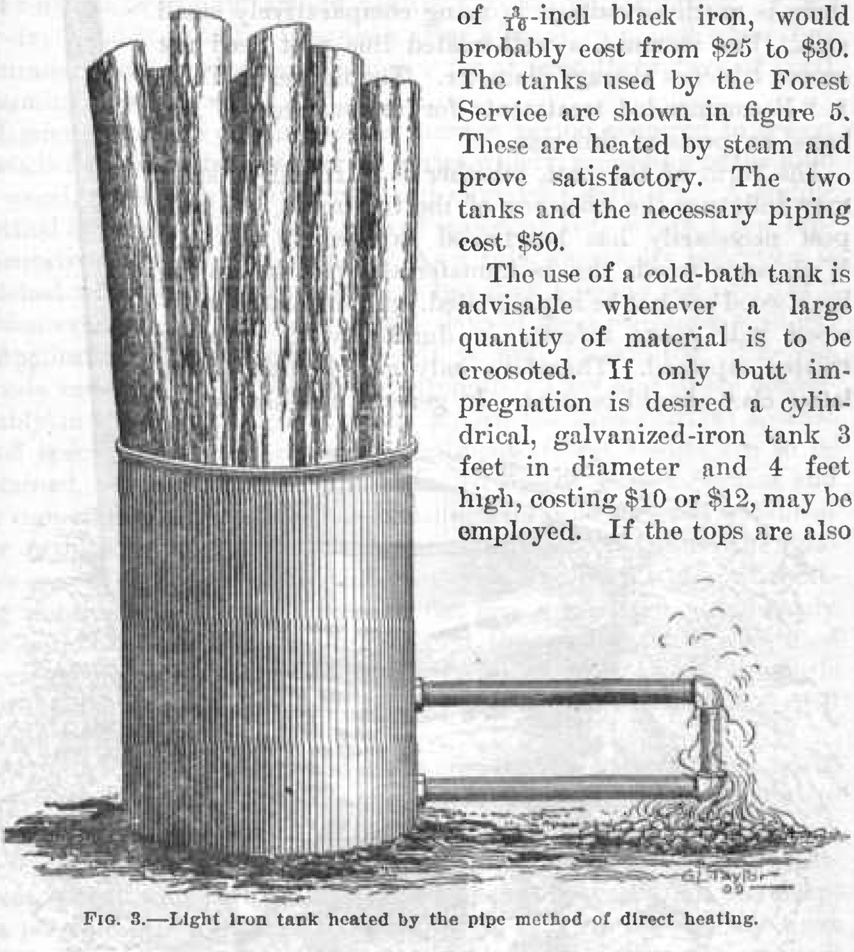

FIG. 3.—Light iron tank heated by the pipe method of direct heating.

Preparation of the posts for treatment.—For treatment with creosote some importance attaches to the size and the form of the posts. The

removal of the bark and the seasoning of the wood before treatment are essential for success. At present many posts of large size are used in order that the strength of the fence may still be sufficient after decay has progressed for several years. Obviously such large posts are unnecessary if proper preservative treatment is given, and, since the cost of treatment increases rapidly with the size of the post, there is much advantage in using comparatively small ones. For instance, a well-treated line post need not exceed 5 inches average diameter. The figures in Table 1, "Recommended treatments for various woods," are based on posts of this size.

The form of the post, whether it is round or split, may influence the efficiency of the treatment. A split post necessarily has heartwood exposed to the air. With some woods this is immaterial; with others the heartwood can not be impregnated, and untreated heartwood will prove inferior in durability to properly treated sapwood. Therefore, only round posts of the latter class should be used. In general, the heartwood

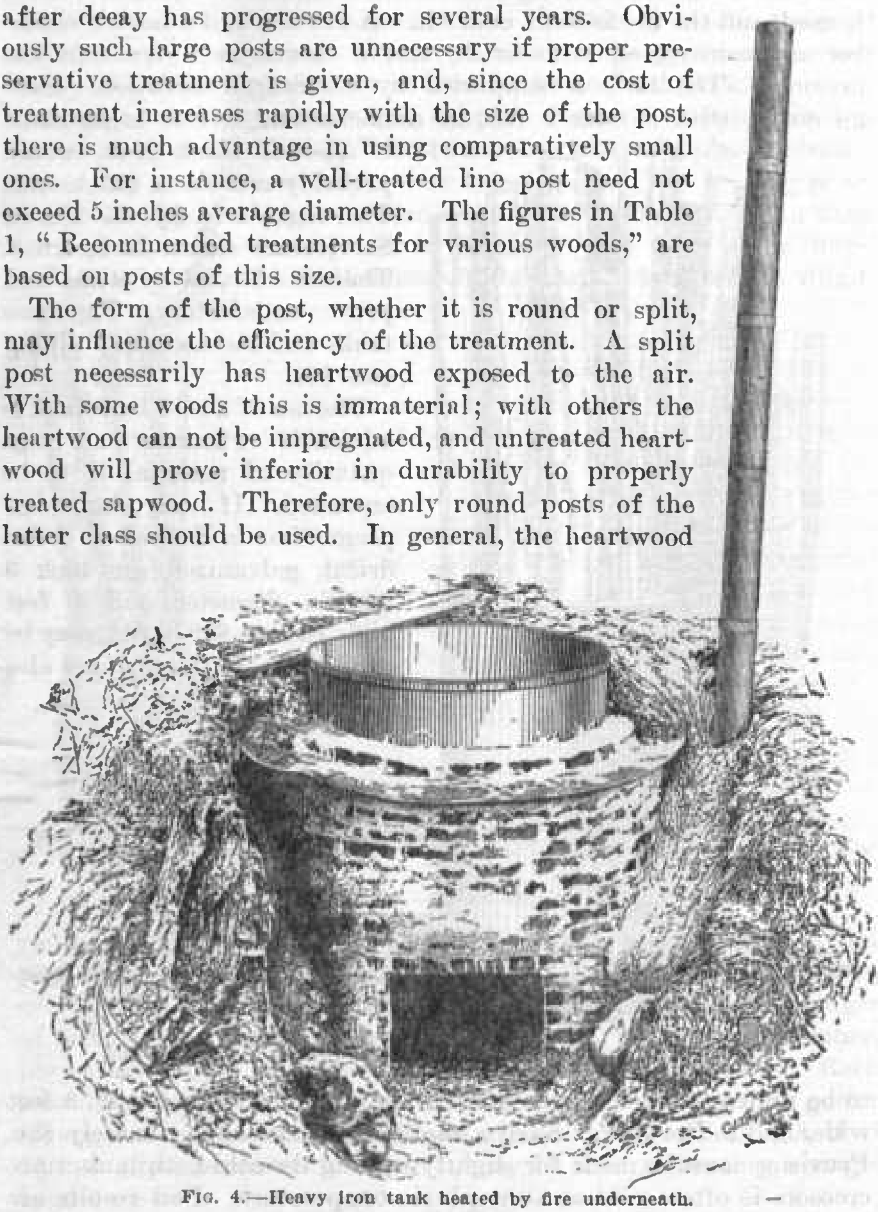

FIG. 4.—Heavy iron tank heated by fire underneath.

that is highly colored, such as that of oak and yellow pine, is practically impenetrable.

The tops of the posts should be cut obliquely to shed rain water. A bevel made with an ax is preferable to one made with a saw, because

it is smoother. Beveling is particularly important if the tops of the posts are not to be treated.

Bark retards or prevents the penetration of the preservative into the wood. It also uselessly increases the cost of treatment by itself absorbing oil. Peeling the posts before treatment is, therefore, necessary. Even the papery inner bark should be carefully removed, especially in the case of pine and basswood.

Thorough seasoning should always precede impregnation. Even air-dry wood is unfit for treatment after a heavy rain, and when thus saturated should be permitted to dry for at least three days of good seasoning weather.

Under favorable conditions the average period required to season posts is five weeks, but this period varies widely, according to the kind of wood, the season of the year, and climatic conditions. A simple method of determining the degree of seasoning is to weigh a few representative posts every few days. As a rule, an air-dry condition is reached when the loss of moisture is less than 1 pound per post (of 5 inches average diameter) during five days of good seasoning weather.

Application of the preservative.—It is well known that different woods vary greatly in weight and strength. They also differ considerably in the ease with which they absorb the preservative; so that each species requires a different treatment if best results are to be obtained. In the experiments conducted by the Forest Service and its cooperators the purpose has been to determine the best treatment for various woods. The investigations have also indicated the relative ease of treatment of the different woods. Two methods of treating were employed. In some cases but one tank was used, and only the butts of the posts were impregnated, though two tanks were used in creosoting most of the woods. In the second method only the butts were immersed in the hot bath, while the whole posts were submerged in the cold bath.

Most species will absorb too much creosote if a very long treatment is given. Therefore, to make the treatments economical the absorption must be limited to 0.4 gallon per post if only the butt is treated, or 0.6 gallon per post if the top also is impregnated. The best treatment is that which will give, with a reasonable absorption, the deepest possible penetration of the oil into the wood in the shortest time.

Woods which are naturally durable in contact with the ground, such as cedar, locust, white oak, and black walnut, were also included in the experiments. In general, a heavy treatment is required to impregnate their sapwoods, and their heartwoods can not be successfully treated. Though preservative treatment somewhat prolongs the life of these species, they are not only too expensive to be treated with economy, but even without treatment they are likely to cost more

than cheaper and equally satisfactory posts that can be had by creosoting an inferior wood.

In California, posts of different species of eucalyptus were creosoted. A three-hour bath in hot oil was a sufficient treatment for green posts, but the oil penetrated very irregularly. When the posts were inverted after butt treatment, the free oil followed the large ducts in the wood and appeared on the top of the post. A few tests also were made on quaking aspen, boxelder, Douglas spruce, and silver maple. Quaking aspen will probably require a treatment similar to that recommended for cottonwood. The heartwood of Douglas spruce is impenetrable by open-tank treatments, but the sapwood may be easily impregnated. Boxelder and silver maple absorb creosote readily, but the penetration at the ground line is relatively small.

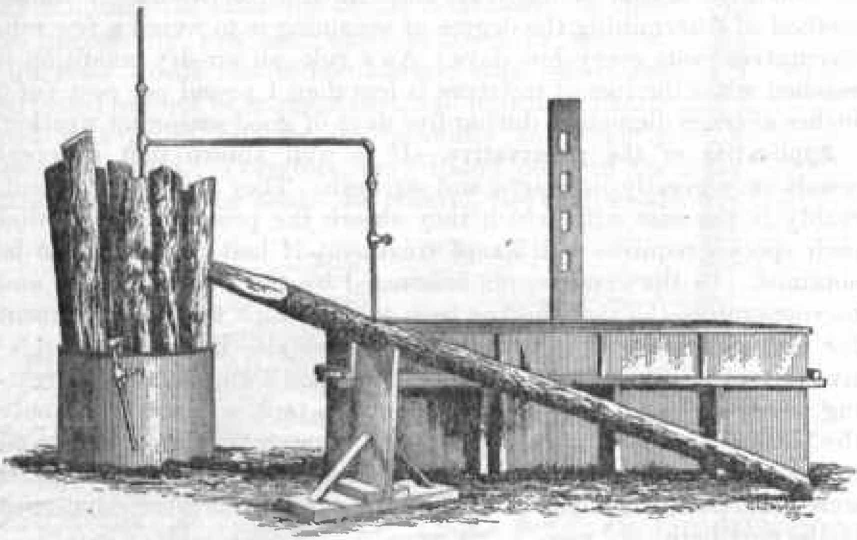

FIG. 5.—Experimental outfit heated by steam. The rectangular horizontal tank is for the cold bath.

Therefore, whenever a choice of species is possible, only the woods best adapted to preservative treatment should be used. The relative fitness of several of the commoner kinds of wood is shown in Table 1. Yet, because of the different methods used, this table can not be depended upon to give the exact length of treatment in each case. It is easy, however, to find the best treatment in any particular instance. With well-seasoned material the absorption is indicated by the difference in the weight of sample posts before and after treatment. Pounds may be converted into gallons by dividing by 8.5. The penetration at the ground line may be gauged by boring with an augur or chipping with an ax. Surfaces thus exposed should be well coated with creosote before the post is set. If the first treatment

is not satisfactory, better results can be obtained by varying the lengths of the hot and cold baths. If the penetration is insufficient the period of heating should be increased; if the penetration is satisfactory, but too much oil is absorbed, the cold bath should be shortened.

TABLE 1.—*Best results secured in the treatment of various woods.*

[All posts were round, peeled, and seasoned.]

Species.	Absorption per 5-inch post.	Penetration. 2 feet from butt.	Penetration. 2 feet from top.	Single-tank treatment. Butt. Hot oil.	Single-tank treatment. Butt. Cooling oil.	Single-tank treatment. Top.	Double-tank treatment. Hot oil.	Double-tank treatment. Cold oil.
	Gallons.	*Inches.*	*Inches.*	*Hours.*	*Hours.*		*Hours.*	*Hours.*
Ash, white	0.4	0.4		5	12	Dipped[a]		
Basswood	.6	.1	0.05				1	½
Beech	.6	1.0	.4				1	¾
Birch, river	.6	.7	.3				3	1
Butternut	.4	[b].5		6	12			
Cottonwood	.4	.6		1	12	Dipped[a]		
	.6	.3	.1				1½	1
Elm, slippery	.6	[b].3	.1				1½	1½
Elm, white	.4	[b].4		6	12			
Gum, black	.6	.6	.3				1	1
Gum, cotton (tupelo)	.6	.6	.3				1	1
Gum, sweet (red)	.6	1.0	.3				1	¾
Hickory, bitternut	.4	.5		6	12	Dipped[a]		
Magnolia, sweet (bay)	.6	.4	.2				1	½
Maple, red	.6	1.0	.3				4	2
Maple, sugar	.6	.2	.1				3	2
Oak, pin	.5	[b]1.0	.5				1	¾
Oak, red	.4	[b].5	.3				1	¾
Pine, loblolly	.5	1.5	1.0				1½	1
Pine, lodgepole	.6	1.2	.6				1½	1
Pine, pitch	.5	1.0	.3				3	1
Pine, scrub	.5	1.0	.4				3	2
Pine, shortleaf	.5	1.0	.3				3	1
Poplar, white	.5	.5	.2				6	12
Sycamore	.6	1.0	.2				1	½
Tulip-tree	.6	.4	.1				2	½
Willow, white[c]	.6	.6	.2				4	1

[a] Dipped for 5 minutes or more.
[b] Width of sapwood. Penetration limited by impenetrable heart.
[c] Requires especially thorough seasoning.

The procedure in treating may be summarized as follows:

(1) Raise the temperature of the hot bath to 220° F. before putting the posts in the tank. Maintain this temperature throughout the bath. Have sufficient oil in the tank to submerge the butts 6 inches higher than the ground line when the posts are set.

(2) If only one tank is used, the oil will be absorbed by the posts during the cooling bath, and more should be added to keep them submerged to the proper depth.

(3) If two tanks are used, liquefy the cold bath by heating. The best temperature is from 100° to 120° F. Transfer the posts from the hot to the cold bath as quickly as possible. At least that portion of the post which has been heated should be immersed quickly in the cold bath.

Cost of treatment.—General cost figures are valueless, but the cost under any specified conditions may be readily ascertained. Apparatus and oil are the two most important items of expense. The charge per post for the apparatus should not exceed 1 cent when a serviceable outfit is used and its permanency is considered. Labor and fuel charges are usually ignored in fence-post treatments, and hence are omitted in the examples of cost given below. If, however, it is desired to include them, the number of posts treated daily is important. Of course the size of the post affects the cost.

The cost of creosote by the barrel varies widely according to locality. In the Eastern States it costs 12 to 15 cents per gallon; on the Pacific coast, 15 to 20 cents; in certain localities in the Rocky Mountain region it is as high as 30 cents. In Table 1 the absorption of oil per post is stated for the recommended treatment. To this must be added a certain quantity of oil which evaporates from the hot bath. The amount of creosote which evaporates depends mainly upon the grade used, but 20 per cent of the absorption is accepted as the average. The quantity of oil consumed per post is, therefore, one and one-fifth times the absorption.

Table 2 shows the cost of treatment under certain conditions.

TABLE 2.—*Cost of treatment per post under certain known conditions.*

	Items of cost.				Cost of treated post.
	Post.	Treating plant.	Creosote absorbed.	Creosote volatilized.	
Loblolly pine (Louisiana) or scrub pine (Maryland); entire post impregnated; creosote, at 15 cents per gallon	$0.05	$0.01	$0.08	$0.01	$0.15
Quaking aspen (Maine) or cottonwood (Minnesota); butt impregnated; top dipped; creosote, at 12 cents per gallon	.05	.01	.05	.01	.12

Value of treatment.—In portions of Maryland locust posts cost 35 cents apiece, and are difficult to obtain even at this price. A pine post, treated in the manner recommended in Table 1, will doubtless equal one of locust in durability, and will cost only half as much. In

the prairie region of Minnesota willow posts of sufficient size to last fifteen years cost 25 cents. Creosoted cottonwood posts could be substituted for these, and would be considerably cheaper as well as more durable. In sections of Idaho lodgepole pine posts are extensively used. Table 3 illustrates the annual saving effected by creosoting such posts.

TABLE 3.—*Comparative costs of untreated and treated posts of lodgepole pine in Idaho.*

	Untreated.	Treated.
Initial cost of post	$0.06	$0.06
Cost of treating post	.00	.15
Estimated cost of setting post	.12	.12
Total cost of set post	.18	.33
Estimated length of service ... years	4	20
Annual cost of post (allowing 6 per cent interest on investment) approximately	$0.05	$0.03
Annual saving per post treated		.02

In general, it may be said that any post properly creosoted will last twenty years. To determine the exact length of life under various conditions, posts experimentally treated are being tested in fences, and detail maps on which each post is numbered are made to record the kind of post and its treatment. By means of such maps it is possible to study the durability of the individual posts and the effects of various treatments under different conditions.

PROLONGING THE LIFE OF SHINGLES.

Wood used on the farm in various forms other than post material may often be advantageously preserved from decay by chemical treatment. The results obtained assuredly justify the cost of treating all timbers used in foundations, sills, beams, and planking, as well as the lower portions of board fences, and the lumber used near the ground in sheds and barns. The treatment of these is very similar to that given posts. Shingles, however, form an important special class of material.

With the grades of shingles obtainable nowadays exposure to rain and sun commonly results in warping or curling. Water absorbed during a storm subsequently evaporates rapidly from the upper surface and rather slowly from the lower surface. Consequently, the upper part of the shingle shrinks more than does the under, and curling or warping results. The importance of excluding moisture is obvious. In addition to this, it is advisable to employ an antiseptic to retard decay. The best preservative, it follows, must possess such qualities as will operate in both these ways to prolong the life of the shingles.

The necessity of applying preservatives only when the wood is thoroughly dry may again be emphasized.

NONANTISEPTIC PRESERVATIVES.

The application of paint is the preservative measure most commonly used with shingles. The method of applying it is of paramount importance. Dipping the shingles individually is the only satisfactory procedure. When a roof is painted ridges of paint are formed at the bases of the shingles, owing to the irregularities of the surface over which the brush passes. These cause the water to permeate the crevices between the shingles and frequently hasten decay.

ANTISEPTIC PRESERVATIVES.

The best antiseptics for shingle treatment are creosote and other derivatives of coal tar. Painting the roof with these oils is a rather satisfactory method of treatment, since the coal-tar derivatives penetrate the shingles better than ordinary paint and do not leave ridges below the base of the shingles. At least two coats should be applied. Dipping the individual shingles gives good results. The best results are, however, obtained by heating and cooling the wood in the preservative, as described for the treatment of fence posts. Sap loblolly pine shingles may be thoroughly impregnated by means of the open-tank process. This method is the best even for woods which resist the penetration of the oil; for example, white cedar. Its advantages are two-fold—the shingles can be treated in bundle form, and, with proper treatment, the surface of the wood will be free from surplus oil.

The open-tank process has already been explained. The apparatus used for posts may be employed, or if shingles exclusively are to be treated the form of the outfit may be modified. The simplest apparatus is a single tank large enough to hold a bundle of shingles. If a larger capacity is desired, the depth rather than the width should be increased, for, in order to minimize the loss from volatilization, the oil surface exposed to the air should be kept as small as possible. The best treatment for various kinds of shingles has not yet been determined. The proper length of treatment may, however, be readily decided in any particular instance by weighing the shingles before and after treatment. An absorption of 12 or 13 pounds per bundle, or 6 gallons per thousand shingles, is advisable. The cost of treatment per thousand shingles should range from $1.25 to $1.50. In order that the deepest penetration compatible with this absorption may be secured, the heating should be relatively long.

Creosoted shingles possess certain objectionable qualities, though none which prohibit their use. Among these may be mentioned their strong odor and their contamination of cistern water. Further,

since the shingle nails become covered with creosote and can not be held in the workman's mouth, it is said to be more difficult to lay these shingles. The odor, however, disappears in the course of a few weeks—two weeks in one case observed; the contamination of the cistern water is also of short duration—in one instance the water was tasteless after three days of rain; and, in any case, the water from a newly creosoted roof can be diverted from the cistern for a week or so, or until there is no danger of making the water taste, and the use of a shingle-nailing machine obviates the difficulty in laying the shingles. All these objections are removed if the shingles are seasoned for a few weeks between treating and laying.

It is impossible to paint creosoted shingles satisfactorily; hence, if the brownish shade of the creosote is deemed undesirable, it is necessary to stain the shingles during the preservative treatment. Of the common colors green pigment is expensive and red and brown are cheaper. Further, it is necessary to use a comparatively large quantity of green to obtain a satisfactorily colored creosote, while a relatively small amount of red or brown pigment suffices. For these reasons it is not feasible to stain shingles green by the open-tank method of creosoting, and brush treatment or dipping must be resorted to. The latter two methods may also be used with a variety of patented stains containing creosote.

To obtain a red or a reddish-brown creosote 8 to 12 ounces of "color ground in oil," mixed with an equal bulk of linseed oil, should be used for each gallon of preservative.

CONCLUSION.

In many localities the need for the preservative treatment of farm timbers is imperative. Throughout wide areas the advisability of using creosoted posts is indisputable. In spite of these facts it is often difficult for a farmer efficiently to treat his own material with preservatives. This, however, does not indicate that the work should be neglected. Rather it points to some different means of securing the desired result. There are two practical methods of doing this. One is for some individual to undertake the work for the neighborhood. A small wood-preserving plant could be profitably operated in connection with a thrashing outfit, a feed mill, or sawmill. The other plan is for several farmers to cooperate in establishing and operating the plant. As an indication of the success which should attend such an undertaking the cooperative creameries of various sections of the country may be cited. The means, then, may vary, but it can not be too strongly emphasized that every agricultural district should possess the facilities for increasing, by preservative treatment, the durability of farm timbers locally used.

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